Evaluating customer usage and satisfaction in Bahrain towards AI-enabled e-commerce websites

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***Abstract*—With the development of technology, online shopping has become popular, especially in countries with high internet penetration rates. In Bahrain, the internet penetration rate reached 99 percent, which directly impacts the e-commerce market's revenue, which is projected to reach USD 1.434 million in 2022. The use of artificial intelligence in e-commerce helps businesses to target customers better and generate sales. Knowing that customers are using the AI features as predicted and satisfied with them is very significant for online businesses to assist them while adjusting their marketing strategies. This study aimed to measure customer usage and satisfaction in Bahrain towards the AI features in the two largest global e-commerce platforms – Amazon and Alibaba. The study focused on the most common AI features used in e-commerce websites: recommendation systems, chatbots, virtual assistants, search engines, image recognition technology, augmented reality, and product reviews. It also examined if customer's demographic attributes, namely, age, gender, and highest education level, influence the levels of customer usage and satisfaction. The IS Success Model was adapted to formulate the research model and hypotheses. Using a CSAT survey, data were collected from a random sample of 126 Bahraini customers. The findings were analyzed using Pearson coefficient, T-Test paired samples, and one-way ANOVA. The results showed differences in usage, customer satisfaction, and purchase experience. It also demonstrated that the demographic attributes and different business strategies might affect the use, customer satisfaction, and purchase experience. Managerial implications are discussed based on the results of the study.**

Keywords—e-commerce, artificial intelligence, customer satisfaction, IS Success Model, CSAT.

I. Introduction

Technological advancement keeps on providing opportunities for all sectors across various industries. Technology aids people in improving the efficiency, quality, and cost-effectiveness of services offered by businesses. Artificial Intelligence is one technology that keeps transforming our lives since it is integrated into almost every device we use. Considering the development and involvement of Artificial Intelligence in the e-commerce industry, about 90% of customer interactions are handled without human interference [1].

The transition towards online shopping has inclined rapidly, and incorporating AI technologies is likely to be a transformative force in the e-commerce industry. Hence, analyzing consumer behaviors promptly is crucial to measuring the success of e-commerce strategies. The customer satisfaction of most online retailers declined from 2020 to 2021 [2]. This can be related to the unexpected consumer behaviors during the COVID-19 pandemic and the adaptation of online retailers to the new situation. Introducing new features, like AI features, to e-commerce websites requires such analysis too. Do online customers use the AI features while shopping as e-retailers expect? And are they satisfied with them? Does the use of AI features influence the level of customer satisfaction and the purchase experience? Does the usage of the AI features, customer satisfaction, and purchase rates differ from one e-retailer to another if they are of similar AI capabilities? Do different customer segments show different levels of usage, customer satisfaction, and purchase rates?

The main objectives of this study were: (1) to evaluate the usage and level of satisfaction of Bahrain customers with AI features of e-commerce websites, (2) to examine the demographic factors that influence the usage, satisfaction, and purchase levels, and (3) to determine if re-retailers of similar AI capabilities show similar customers' usage, satisfaction, and purchase levels. The survey was conducted for the B2C platforms of Amazon and Alibaba Group, AliExpress for the latter. These two e-businesses were compared as they show many similarities in AI strategies, talents, ways of working, tools, data, and adoption, which mainly identify the AI power of businesses, as suggested by [3].

II. Literature Review

A. AI in e-commerce

Artificial intelligence is a field of computer sciences that studies the simulation of human intelligence by machines to assist in solving problems and making decisions [4]. AI applications utilize data mining and machine learning algorithms in different ways for different purposes. In e-commerce, AI can be integrated into product or service development, service operations, marketing, sales, risk management, manufacturing, human resources, supply chain management, and finance [3] using different tools such as chatbots, recommendation systems, virtual assistants, process automation software, product reviews, and customer-centric search engines. The diversity of AI applications helps improve productivity, increase revenues, and reduce costs. Answering routine questions during days of high-volume sales by a chatbot or a virtual assistant is a good example [5]. From a customer's perspective, AI features help customers find what they want more easily and quickly, get instant customer

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service, and facilitate comparing products and making decisions.

Amazon and Alibaba, the two largest e-businesses worldwide, have integrated AI into their different platforms. Amazon uses AI and ML in three products: Alexa, Amazon Go Store, and Amazon recommendation engine. Alexa is the virtual assistant technology of Amazon and the most visible AI tool. Amazon Go Store is a brick-and-mortar store that uses facial recognition software to allow customers to shop without a need to check out, use cash, or a credit card. Amazon's recommendation engine helps customers and businesses to get matchable products and services easily. It generates 35% of the company's revenue. Amazon invests billions of dollars into its R&D and laboratories, following the "Flywheel" strategy, which proposes getting advantages from the energy needed for AI projects start-up to come up with new inventions [6,7] continuously.

On the other hand, Alibaba Group manages more than ten domestic and international e-businesses, each utilizing AI for unique goals and to complement each other. AI tools help the company to predict demands, optimize supply chains, personalize products and services, and streamline global delivery. It has its independent R&D division, seven research labs, and an academy that all work to produce innovations in image processing, personalization, recommendations, augmented reality, chatbots, video recognition, and Cloud AI [8,9].

B. Assessing Technology Adoption

When businesses employ new technology, they need to assess the success of adopting it using models like the Technology Acceptance Model (TAM) and the IS Success Model (ISSM). TAM proposes that users are willing to use new technology if it is easy to use and useful, where the perceived usefulness and perceived ease of use can influence each other (see Fig. 1) [10]. On the contrary, the ISSM focuses on the net benefits for users and organizations. It suggests that users are willing to use new technology and be satisfied with it if it provides high information quality, system quality, and service quality. It also demonstrates that net benefits have a direct relationship with the intention to use or the actual use and the level of user satisfaction, which in turn have a direct relationship (see Fig. 2) [11].

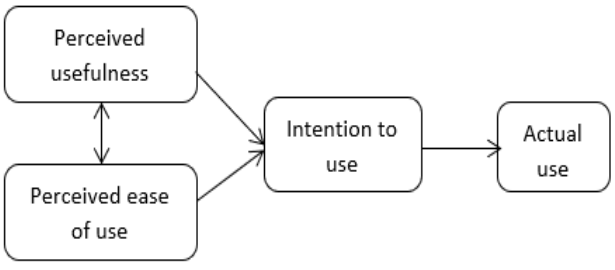

Fig. 1. Technology Acceptance Model (TAM)

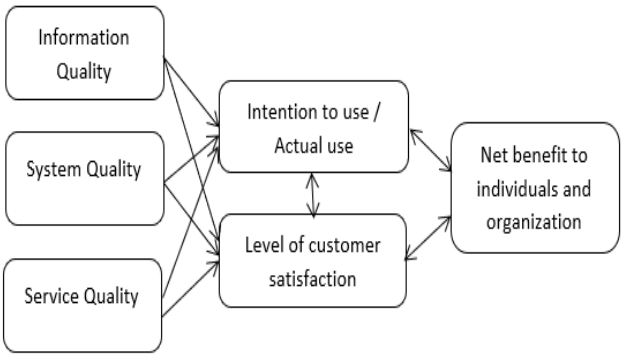

Fig. 2. IS Success Model (ISSM)

The three quality dimensions in the ISSM can be measured using different attributes. For example, clarity and usefulness of the presented output can be used to measure information quality; easy-to-understand interface, easy-to-use system, quick responses, and accurate results can be used to measure system quality; and responsiveness, accuracy, and friendliness can be used to measure service quality [12].

System use dimension can be measured by automation level, extent, frequency, and thoroughness. Automation level is the amount of business functions that are encoded by the information system; extent is the percentage of used functions to all functions provided; frequency is the number of times functions are used to the maximum number of times they could be used, and thoroughness is the depth of using the functions to the maximum depth of use [13].

Compared to the TAM, the ISSM includes the user satisfaction dimension as a metric for assessing a new technology's success. Customer satisfaction is defined as "the number of customers, or percentage of total customers, whose reported experience with a firm, its products, or its services (ratings) exceeds specified satisfaction goals" [14]. Researchers stated that customer satisfaction is a key performance indicator that has a positive relationship with customer loyalty, customer retention, purchase intention, and trust. However, achieving a high customer satisfaction level is difficult because of the variety of demographic, social, legal, political, and behavioral factors that influence it [15,16]. Companies usually use systematic surveys such as Customer Satisfaction (CSAT), Customer Effort Score (CES), and Net Promoter Score (NPS), which allow them to get quantitative findings [17]. Each metric has a unique purpose: CSAT metric focuses on the level of satisfaction with products or services; CES focuses on the ease of service experience; NPS focuses on recommending an organization to others. They all have scales that can be easily analyzed by calculating the percentage of the two top scores [18].

III. METHODOLOGY

A. Research Background

E-commerce has and will continue to expand rapidly in Bahrain. This is primarily due to three main factors: internet penetration, demographics of Bahrain, and government support. Internet penetration has constantly seen a rapid increase to reach 99% in 2021 [19]. The demographics of Bahrain contributed to this increase, as the population under the age of 55 is 89.75% [20]. Moreover, the population's

digital literacy is considered very high, with all schools having access to free internet since 2004 and the government offering digital literacy programs to adults through continuous education programs [21]. However, like everywhere in the world, Bahrain was affected by the Covid-19 Pandemic, but its effect on e-commerce was positive. According to [22], "86% of customers became digital converts to e-commerce". The e-commerce expenditure has nearly doubled from 2017 to 2022 and is expected to triple by 2025 [23]. In addition, researchers suggest that artificial intelligence can increase customer satisfaction by 25% by 2023 [24]. Hence, this study focused on the usage and satisfaction levels towards AI features on e-commerce websites in Bahrain and their effects on the purchase behavior.

The study aimed to:

1. Evaluate Bahraini customers' usage and satisfaction with AI features of e-commerce websites.
2. Examine the demographic factors influencing usage, satisfaction, and purchase levels.
3. Determine if re-retailers of similar AI capabilities show similar usage, satisfaction, and purchase levels.

To enhance the reliability of the results, the study was conducted on two e-commerce websites: Amazon and AliExpress. They were chosen as both are B2C platforms of large e-retailers in the world, and both have high and similar capabilities of AI in terms of AI strategies, talents, ways of working, tools, data, and adoption, which mainly identify the AI power of businesses as suggested by [3].

B. Research Model and Hypotheses

The study focuses on four main attributes: the AI features, the use, the level of satisfaction, and the purchase experience. The ISSM was adapted to illustrate the relationships between these attributes (see Fig. 3).

The AI features were classified into three groups: information, system, and service. Some of the features can fit into more than one group. For example, search engines can fit in the information quality group as the information provided by this feature can be measured in terms of relevance and conciseness. Also, it can fit in the system quality group as the feature can be measured in terms of ease of use. The same scenario with chatbots and virtual assistants. They can be measured for responsiveness and friendliness as a service and flexibility and customization as a system (see Table I).

The system use (SU) was measured by the extent of use, which is the number of AI features used compared to the total number of AI features provided on the websites. In contrast, the level of customer satisfaction (CS) was measured using the CSAT metric that suits the nature of e-commerce websites and the purpose of the research.

The benefit for individuals is to get what they want, which is normally purchasing the desired products or services or getting information that helps them to make a decision, while the ultimate benefit for the e-retailers is to gain profit through making sales. So, the net benefit can be measured by the number of purchases made by online customers or the purchase experience (PX).

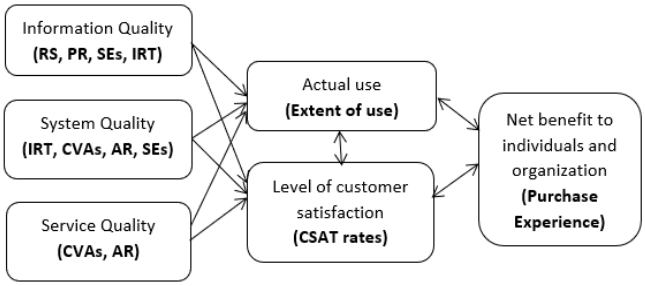

Fig. 3. The research model adapted from the ISSM.

TABLE I. THE CLASSIFICATION OF AI FEATURES INTO THE QUALITY DIMENSIONS

Quality Dimensions	AI Features
Information Quality	Recommendation Systems (RS)
	Product Reviews (PR)
	Search Engines (SEs)
	Image Recognition Technology (IRT)
System Quality	Image Recognition Technology (IRT)
	Chatbots and Virtual Assistants (CVAs)
	Augmented Reality (AR)
	Search Engines (SEs)
Service Quality	Chatbots and Virtual Assistants (CVAs)
	Augmented Reality (AR)

The research objectives and the research model propose seven hypotheses:

- **H1:** There is a direct relationship between the extent of using the AI features of e-commerce websites and the level of customer satisfaction (SU ↔ CS).
- **H2:** There is a direct relationship between the level of satisfaction with using the AI features and the number of purchases. (CS ↔PX)
- **H3:** There is a direct relationship between the extent of using the AI features of e-commerce websites and the number of purchases (SU ↔ PX).
- **H4:** Gender does not influence the levels of usage and customer satisfaction toward AI features of e-commerce websites.
- **H5:** Age group does not influence the levels of usage and customer satisfaction towards AI features of e-commerce websites.
- **H6:** Qualification level does not influence the levels of usage and customer satisfaction towards AI features of e-commerce websites.
- **H7:** E-retailer with similar AI capabilities have similar levels of usage and customer satisfaction towards AI features of e-commerce websites.

C. Sampling

A random sample of size 150 participated in the study. Only the responses from people in Bahrain were considered, which was 126. The percentage of female participants was almost double the percentage of males. 50% of the respondents were from Gen Y, 35% were from Gen X, 15% were from Gen Z, and none were from the boomer II group. The top education level groups were degree and masters, where the percentages were 43.7% and 26.2%, respectively. The diploma and school groups had the same percentage, 11.9%, while the Ph.D. holders were only 6.3% of the sample (see Table II).

TABLE II. THE DEMOGRAPHIC STATISTICS OF THE SAMPLE

Variable (126)	Demographics group	Frequency	Percentage
Gender	Male	48	38
	Female	78	62
Age Group	Gen Z	19	15
	Gen Y	63	50
	Gen X	44	35
	Boomer II	0	0
Highest Education Level	School	15	12
	Diploma	15	12
	Degree	55	44
	Masters	33	26
	PhD	8	6

D. Survey

A CSAT questionnaire was constructed. It consists of four sections: (1) demographic data: gender, age group, and educational level; (2) purchase experience: the number of purchases done by the customer; (3) CSAT questions: five-point Likert Scale questions that were adapted from [2] and also adjusted to measure the three ISSM quality dimensions focusing on the most popular AI features used in e-commerce websites: recommendation systems, chatbots and virtual assistants, image interactivity technology, product reviews, augmented reality, and search engines, where five meant very satisfied, and one meant very unsatisfied; and (4) open-ended questions: questions that are related to the customer experience with the two websites in terms of using the AI features and purchasing. As Arabic and English are the two main languages in Bahrain, the survey was prepared in Arabic and English using an electronic form and shared randomly.

IV. FINDINGS AND DISCUSSION

A. Findings of SU, CS, and PX

The SU of AI features was measured using the extent of use metric by calculating the percentage of the used features to the total number of features provided. The results showed that 90% of the respondents had used at least one AI feature on Amazon or AliExpress websites. The average percentage of use per AI feature was around 74%, where the most used feature was search engines, and the least used feature was augmented reality (see Fig. 4).

The CS was measured following the CSAT analysis standard by calculating the percentage of the two top scores, 4 and 5. The average CS for all AI features was around 61%, where the search engine scored the highest satisfaction rate and augmented reality scored the lowest satisfaction level (see Fig. 5).

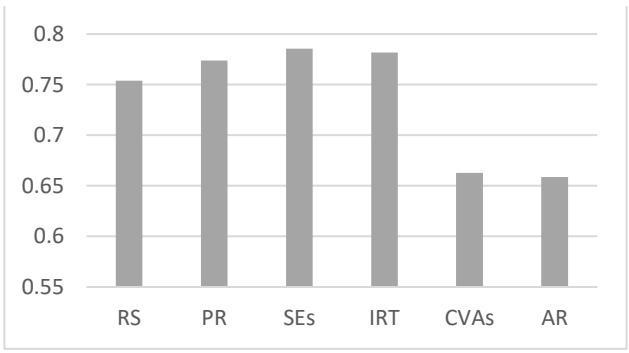

Fig. 4. The extent of use per AI feature

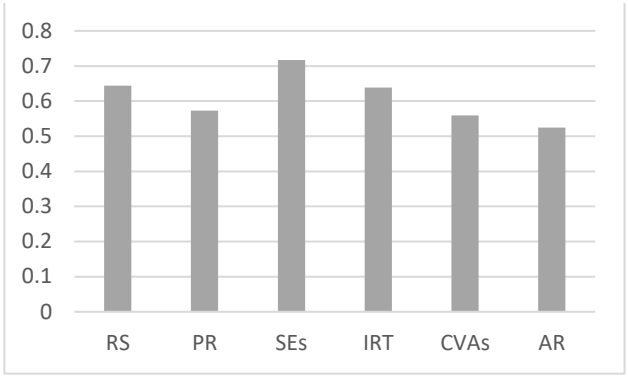

Fig. 5. The customer satisfaction level per AI feature

Comparing the average CS to the ACSI benchmark for e-retailers [2], the level of CS was low as the score was 61%, and the benchmark reached 87%. However, the satisfied respondents mentioned the AI features, like the recommendations and product reviews, as reasons for being satisfied. They said these tools helped them make decisions easier, while the unsatisfied respondents mentioned other factors like the platform language, product quality, and shipping issues. This issue was researched by [25] and they found that the overall satisfaction is a moderator for the transaction-specific satisfaction. So, in this context, the overall CS affected the level of CS towards the AI features and the dissatisfaction with nontechnical factors, like shipping, affected the CS with the technical factors.

Comparing the average SU and average CS of the different AI features, the results illustrated a direct relationship between SU and CS (p-value = 0.0007, Pearson correlation =0.8), which is compatible with the study of [10 – 12]. Factors like ease of use and familiarity can positively affect the SU and CS levels [26, 27]. For example, search engines had the highest SU and CS percentages since internet users are more familiar with using search engines. There are 104,441 Google searches every second [28]. On the other hand, augmented reality provides a higher level of communication, but it had the lowest SU and CS percentages. One of the reasons could be that not all e-commerce websites utilize it because of its cost, security, and privacy issues [29], which negatively affect the familiarity of using it. Only 32% of customers use AR while shopping [30] compared to more than 54% of customers who read product reviews before making purchase decisions [31].

The PX was measured by the number of purchases made by the respondents. More than 80% of the participants completed at least one purchase from Amazon or AliExpress, where 22.2% made more than 30 purchases, 20% made between 10 and 30 purchases, and 47% made less than ten purchases. The percentage of people, who purchased less than ten purchases, was relatively high, and the respondents mentioned that the shipping period and shipping cost to Bahrain is not attractive. Others said they use the websites as reference information and for benchmarking but not for purchase.

The ANOVA test was used to study the relationship between PX and SU and PX and CS. Findings showed a significant difference between the respondents who never purchased from the e-retailers and the other groups (p-value < 0.001) regarding both SU and CS. These findings are supported by ISSM and other studies [25 – 27].

B. *Findings of the influence of the demographic attributes and AI Power on US, CS, and PX*

To test H4, H5, H6, and H7 hypotheses, the T-Test function was used, where the standard alpha value of 0.05 was applied, considering that all the hypotheses assumed that there were no differences between the paired samples.

Testing the gender factor showed that gender differences had no significant differences in SU, CS, and PX. The p-values of the paired samples were greater than 0.05 for the three sets of data (refer to Table III). Researchers, in separate studies, suggested that although different genders have different physical and psychological characteristics, it does not necessarily impact the levels of SU and CS, but they might have differences in terms of the perceived values [32 - 35].

Regarding the influence of age groups, the results showed that there was no significant difference between the age groups in terms of PX. However, there was a significant difference between Gen X and Gen Y regarding CS. Gen Y showed a higher percentage (refer to Table IV). On the other hand, there was a significant difference between Gen Y and Gen Z in terms of SU, where Gen Z uses AI features more (refer to table V). There was also a significant difference between Gen X and Gen Z regarding both SU and CS, where Gen Z had higher SU and CS rates (refer to Table VI). Hence, in general, Gen Z, the tech-savvy generation, showed the highest SU rate, 88%, and Gen Y and Gen Z have higher CS levels than that of Gen X, 65 – 66 % compared to 55%. According to [36], older group usually resists adopting new technologies and that directly affect the SU level. The difficulty of using new technology led to dissatisfaction, too [26].

Education level showed significant differences in SU but not the CS and PX. Different T-tests were applied to test if there were any significant differences between the different education levels. Table VII summarizes the findings of pairing the school sample with other qualifications samples. The mean SU and CS of the school education level were 0.7933 and 0.604, respectively. As illustrated in the table, there was a negative relationship between the qualification levels and the p-values. Respondents with lower education levels tended to use the AI features more, which contradicts other studies that found that highly educated customers tend to search as much as possible to find information about products before making a purchase decision [37]. So, they are more likely to use AI features like product reviews, recommendation systems, chatbots, and image augmented reality to help them easily find information, especially since they are more competent with the use of technology. This finding might be affected by the age factor, where the respondents with school qualifications were from Gen Z (see Table II).

Comparing the SU, CS, and PX results of Amazon and AliExpress, the null hypothesis is accepted for the SU, and the PX as the p-value was more significant than 0.05. So, there were similarities in terms of SU and PX. However, the p-value of CS was less than 0.05; and accordingly, the two businesses were different in terms of CS rate. The CS rate of Amazon was higher than that of AliExpress, 67.2%, compared to 56.5% (refer to table VIII). Although the two businesses have similar capabilities in terms of AI, they differ in other factors like service quality, information quality, website design, reliability, and responsiveness, which all correlate with overall CS, as suggested by [25, 38].

TABLE III. PAIRED SAMPLE T-TEST FOR DIFFERENT GENDER

	Female	Male	Mean	P-Value
SU	0.685833	0.7575	0.721667	0.25021
CS	0.598333	0.61666	0.6075	0.587425
PX	0.25	0.25	0.25	1

TABLE IV. PAIRED SAMPLE T-TEST COMPARING GEN X AND GEN Y

	Gen X	Gen Y	Mean	p-value
SU	0.723333	0.698333	0.710833	0.330477
CS	0.5125	0.664167	0.588333	0.00254
PX	0.25125	0.25	0.250625	0.971673

TABLE V. PAIRED SAMPLE T-TEST COMPARING GEN Y AND GEN Z

	Gen Y	Gen Z	Mean	p-value
SU	0.698333	0.879167	0.78875	0.000243
CS	0.664167	0.655	0.659583	0.650463
PX	0.25	0.25	0.25	1

TABLE VI. PAIRED SAMPLE T-TEST COMPARING GEN X AND GEN Z

	Gen X	Gen Z	Mean	p-value
SU	0.723333	0.879167	0.80125	0.001104
CS	0.5125	0.655	0.58375	0.006963
PX	0.25125	0.25	0.25062	0.97828

TABLE VII. PAIRED SAMPLE T-TEST COMPARING SCHOOL TO OTHER EDUCATION LEVELS

Education Level	SU Mean	SU p-value	CS Mean	CS p-value	PX Mean	PX p-value
diploma	0.798	0.629	0.582	0.381	0.250	0.985
degree	0.757	0.009	0.621	0.434	0.251	0.973
master	0.755	0.001	0.586	0.519	0.249	0.963
PhD	0.752	0.001	0.631	0.103	0.250	0.997

TABLE VIII. PAIRED SAMPLE T-TEST FOR DIFFERENT BUSINESSES

	Amazon	AliExpress	Mean	p-value
SU	0.73	0.74333333	0.736667	0.39388
CS	0.671667	0.565	0.618333	0.002432
PX	0.25	0.25	0.25	1

C. *Summary of hypotheses testing*

The seven hypotheses were tested using Pearson correlation, T-Test, and ANOVA functions. The results can be summarized as follows:

TABLE IX. SUMMARY OF HYPOTHESES TESTING

H#	Relationship	P-Value	Results
H1	SU ↔ CS	< 0.05	Supported
H2	CS ↔PX	< 0.05	Supported
H3	SU ↔ PX	< 0.05	Supported
H4	Gender → SU	< 0.05	Supported
	Gender → CS	< 0.05	Supported
	Gender → PX	> 0.05	Not supported
H5	Age → SU	< 0.05	Supported
	Age → CS	< 0.05	Supported
	Age → PX	> 0.05	Not supported
H6	Education → SU	< 0.01	Supported
	Education → CS	> 0.05	Not supported
	Education → PX	> 0.05	Not supported
H7	Business function → SU	0.39388	Not supported
	Business function → CS	0.002432	Supported
	Business function → PX	1	Not supported

D. Limitation

The results cannot be generalized because of the sampling limitations. The sample size was too small, where the sample-to-population ratio was 0.007%. In addition, the sampling was random and might be not representative. For example, 6% of the sample were Ph.D. holders, while the percentage of the degree holders was 44%. This might affect the accuracy of the results related to the highest level of education.

V. Conclusion and Recommendations

The study's main objectives were to evaluate Bahraini customers' usage, satisfaction, and purchase experience with AI-enabled e-commerce websites and to determine if demographic attributes and the businesses AI capabilities influence them. The ISSM was adapted to formulate the research model and hypotheses. Data were collected from a random sample of 126 Bahrain customers using a CSAT survey and analyzed using Pearson coefficient, T-Test, and ANOVA functions. The results showed that the rates of using the AI features of e-commerce websites were above average. Still, customer satisfaction and purchase experience rates were below average. Businesses with similar AI capabilities may have similar usage and purchase levels but different customer satisfaction levels. It also demonstrated that age group directly impacts both usage and satisfaction, and education level directly impacts usage only. In contrast, gender doesn't have an impact on both, and all attributes tend not to have an impact on purchase experience.

Based on the conclusion, e-retailers should consider improving the quality of the information provided to customers to increase customer satisfaction and conversion rates. This could be done by enhancing the results of their website's search engines and encouraging customers to send their SU and PX feedback and reviews. The use of more efficient AI algorithms for the recommendation systems and product reviews can optimize their results and increase the quality of the information.

Moreover, they need to enhance the system usability by implementing simple navigation, user-centric design, reliability, and responsiveness, which would encourage users to adopt the technology, especially Gen X group. In addition, certain groups of people need different levels of simplicity and design, so system personalization and customization can help increase SU and CS.

Improving overall customer satisfaction would also positively impacts conversion rate as there is a direct relationship between CS, trust, and loyalty.

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